

The hybrid future

The changing face of Architecture Engineering and Construction

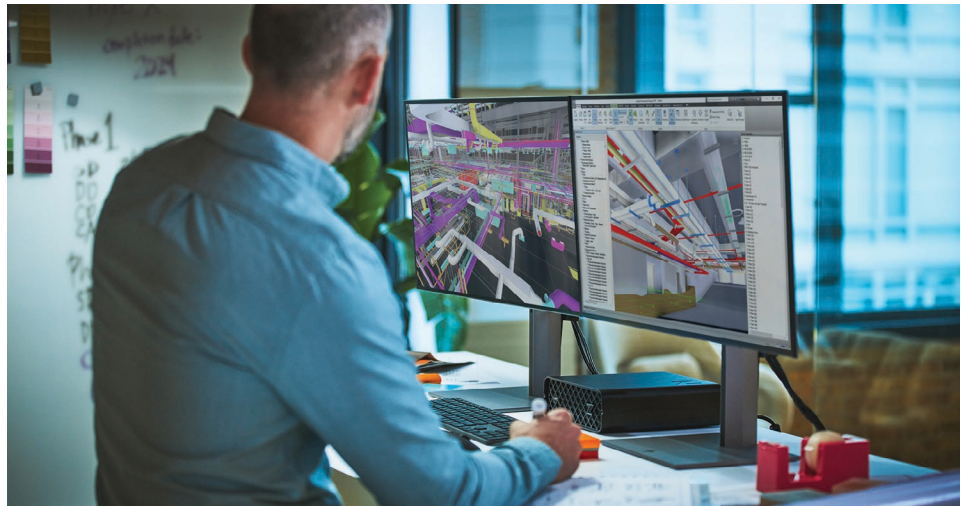
As with many global businesses, Architecture, Engineering and Construction (AEC) firms have seen a rapid rise in the number of staff working from home. Companies that may have previously considered remote working to be a temporary operational necessity are now formalizing plans to give staff the option of flexible working longer term.

An increasing number of AEC firms are embracing the hybrid workplace, where staff choose which days to come into the office and which days to work from home.

There is no one-size-fits all model, so firms need to find some middle ground between offering staff a better work / life balance, and enabling the company to function effectively as a business. This could be through set days in the office each week or on a more ad hoc basis when teams come together for meetings or at specific stages of a building or infrastructure project.

AEC firms can also benefit from offering staff flexible working. They can attract and retain the best talent and, with less office workers to house, potentially downsize premises to save money. Some firms are also seeing this as an opportunity to invest in advanced model-centric digital workflows and bring new efficiencies to the business.

Of course, flexible working for AEC firms throws up a complex set of IT challenges. Building Information Modeling (BIM), which forms the backbone to many AEC



projects, is a collaborative process.

Established workflows typically involve designers running BIM authoring tools on powerful desktop workstations, and contributing to a central BIM model.

In a typical AEC firm, data might be saved direct to a local server. This works fine when everyone is in the office, but can fall down when people work from home, as connectivity becomes less predictable and data becomes fragmented.

There are big benefits to storing all project data in a single location, next to workstations that can be accessed locally or remotely. This could be in the cloud, or on-premise with virtual or desktop workstations. Regardless

of type, all the heavy lifting, including the graphics processing, is done centrally and only the pixels are streamed to the remote device — be that a PC, laptop or zero client. The ability to give extended project teams access to powerful 3D workstations on-demand also opens up huge opportunities for collaboration.

But an IT solution that can effectively support the hybrid workplace is more than just hardware. For the best 3D experience, firms need a high-performance remote display protocol like HP PCoIP technology, which is part of HP Anyware. It is specifically designed for graphics-intensive workflows, typical of those found in AEC where image quality and interactivity are of paramount importance.

Keeping data central

For effective team collaboration on AEC projects, the need for centralized data is more critical than ever.

BIM models are often multi-gigabyte in nature, so can take a long time to download and even longer to upload, even on a fast home internet connection. With flexible working, it can easily become impractical to share files between

home and office and can also lead to synchronization errors, version control issues and lost data.

Storing copies in multiple locations also means firms have less control over their data, and who has access to what, when.

BIM models are large, but other AEC datasets can be even bigger. Design visualization datasets can quickly balloon with high-res

materials and High Dynamic Range Imagery (HDRI). Reality modeling and point cloud datasets can easily run into hundreds of gigabytes.

In such cases it is simply not practical to interact with these files over traditional VPN connections, or, for everyone to have a workstation at home that is capable of processing these vast datasets.

Keeping all data secure in

the datacenter, next to the workstations, can circumvent these challenges, regardless of file size. The data can be accessed from anywhere and as only pixels are streamed to the remote device, on demand, design or collaborative design / review sessions can start instantly, safe in the knowledge that everyone is working on the very latest revision.

Technology trends in Architecture, Engineering and Construction

The AEC sector is changing rapidly with technology having a major influence on the way firms design, collaborate and communicate

The size and complexity of 3D datasets continues to grow at pace. Huge multi-disciplinary BIM models, comprising architecture, structure, and MEP (Mechanical, Electrical and Plumbing) are essential for identifying issues and clashes during design / review and fixing them before they become expensive mistakes on site.

Furthermore, as the AEC industry moves towards digital fabrication, the detail within these models will increase dramatically, with an even higher level of model accuracy required to generate the G-Code that drives Computer Numerical Control (CNC) machines for offsite modular construction.

The rise in data complexity goes beyond the traditional building model. BIM-centric workflows are now augmented with reality data to provide on-site context for new designs. This includes point clouds captured by laser scanners and reality meshes generated from photos and videos taken

by construction workers, drones, or even quadruped robots.

As the complexity of models increases, so does the need to view them on higher-resolution displays. It allows details to be seen within the broader context of the overall design and means designers don't have to waste time zooming in and out to focus on specific sections. Intricate linework and transparency become much clearer and the impact of anti-aliasing, a display technique which can dramatically improve the sharpness of diagonal lines, can be maximized. With point clouds and reality meshes, high-resolution displays can reveal details that simply would not be seen at lower resolutions.

HP Anyware is well suited to support these elevated demands. To deliver a smooth, fully interactive desktop experience, workstations powered by Anyware can deliver up to 60 frames per second (FPS) at 4K resolution or

30 FPS with dual displays at 4K resolution.

Indeed, dual displays are now increasingly common on the desktops of architects and engineers, with multi-application workflows combining BIM with real-time visualization, reality modeling, simulation, collaboration and other 3D-centric software — not forgetting email, video conferencing, web browsers and office applications.

With real-time visualization software such as Enscape and Twinmotion, models are rendered instantly using a workstation with a powerful GPU, giving architects immediate feedback to help explore space, light and materials, and communicate more effectively with clients about the design.

Visualization software might only be needed by certain users at specific stages of a project. Virtual workstations can give firms the flexibility to only give users access to powerful GPU workstations as and when required. In contrast, for general BIM

Moving to the cloud?

There are clear benefits to centralizing workstations, especially for AEC firms wishing to build a solid foundation for flexible working.

In terms of IT management this can be done with dedicated machines in the cloud, or purpose-built rack workstations in an on-premises datacenter.

Some may choose a hybrid approach to IT, using virtual workstations for core BIM workflows and high-performance stand-alone workstations for more demanding software, such as design visualization, point cloud processing or photogrammetry. Others may prefer to provide remote access to dedicated

workstations located in the office.

HP Anyware gives AEC firms flexibility and choice. The software can do the connection management and connection brokering for all different types of workstations — on-premise, cloud or stand-alone — all under a single management environment.





workflows in applications like Revit and Archicad, the GPU requirements are much lower.

Physically-based ray traced rendering, available in applications like NVIDIA Omniverse™ Enterprise, simulates the way light behaves in the real world. With photorealistic results it accurately represent materials. An architect can see exactly how a glass facade will let in light at different times of the day or year. Color accuracy is incredibly important in order to make properly informed decisions and with Anyware users can be confident that a wide color gamut is accurately reproduced.

Extending the reach of data

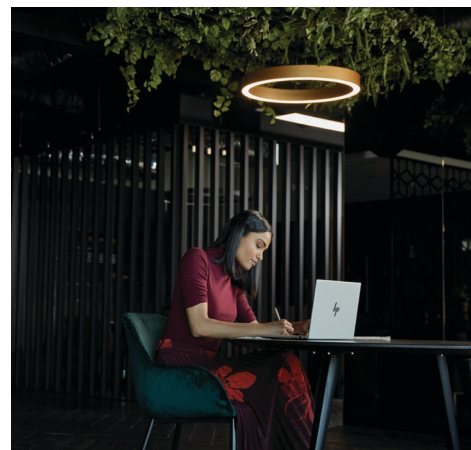
3D data is a hugely important asset for AEC projects. But far too often it is underutilized because it remains locked within the BIM

authoring tool, which is only accessible by trained users with 3D workstations.

BIM collaboration tools such as Revizto, Fuzor and BIMTrack allow non-technical users to get easy access to BIM models for tasks like model co-ordination, issue tracking or simply to extract valuable data from the model.

A standard laptop or desktop might have sufficient processing power to allow users to interact with smaller BIM models. But for larger models, a workstation with a powerful GPU and generous local memory is generally required. The challenge for AEC firms is how to ensure all project participants have access to the right level of hardware to ensure a good experience.

With HP Anyware, AEC firms can remote into dedicated workstations or create a pool of powerful cloud, virtual or desktop



workstations that can be accessed on-demand by anyone with permissions. And that can be from anywhere – in the office, at home, or on the construction site.

Real-time collaboration with NVIDIA Omniverse™ Enterprise

NVIDIA Omniverse™ Enterprise is a new platform designed to bring together architects, engineers and other stakeholders from multiple locations in a visually rich, real-time collaborative environment.

Built around Pixar's Universal Scene Description (USD) framework, the software connects users, their datasets, and disparate design applications in a single shared scene. It powers real time

collaborative iteration on complex datasets by enabling the exchange of only the parts of the model that have changed.

With live links to the leading CAD and BIM tools, including Revit, SketchUp, Rhino, Archicad, 3ds Max and Unreal Engine, Omniverse allows teams to work together, interactively, using their 3D design tools of choice.

Data from multiple applications can be seamlessly streamed

into Omniverse and the resulting digital asset can be interacted with live in a real-time, photorealistic ray-traced viewport accelerated by powerful NVIDIA RTX GPUs.

Users can collaboratively build, modify, and enhance a scene from anywhere, making changes to materials, lights and configurations. The results can be seen in real time as the software accurately path traces the light,

shadows and materials.

Not everyone has personal access to a workstation with an NVIDIA RTX GPU, so cloud workstations provide a means for all users, and not just 3D artists, to view and modify a scene in a real-time photorealistic environment.

With its Build-to-Lossless image quality and color accuracy HP Anyware is a key component in the NVIDIA Omniverse Enterprise solution stack.

What is HP Anyware?

HP Anyware is an enterprise software designed to keep people productive with secured access to their digital workspaces without a VPN

Virtual workstations are much more than simply powerful GPU-accelerated computers in a public or private cloud. They feature several essential software components.

One of the most important is the remote display protocol, which is used to compress and encrypt the pixels on the virtual workstation's 'desktop' and then send them to the client device, where they are decrypted and displayed for the end user. Meanwhile, encrypted mouse and keyboard input is continually sent back to the cloud workstation.

Several different protocols exist, but HP PC-over-IP (PCoIP) is specifically designed for demanding graphics intensive workflows, where both image quality and performance is critical. The protocol is built into the high-performance remote desktop solution, HP Anyware.

Platform flexibility

Anyware can securely deliver virtual workstations from the public or private cloud to almost any device, including home PCs, laptops, thin / zero clients — even mobile devices on a construction site.

Importantly, Anyware is available for Windows, macOS and Linux. AEC firms can remote into Apple Macs to run applications like Vectorworks, Archicad, SketchUp and Twinmotion, as well as Windows workstations for tools like Revit, Enscape and Lumion, or the many other CAD, BIM

and design visualization tools.

The software forms an important part of an integrated cloud workstation solution from several providers including Google Cloud, AWS, Mac Stadium, and Microsoft Azure.

AEC firms are not limited to using just one. With Anyware, IT managers can broker, provision and monitor workstations located in multiple cloud and on-premise environments all from a single management console, installed locally or in the cloud. IT managers can modify, add, or remove user access as required.

Best of both worlds

Anyware places a big emphasis on giving users the best remote experience when using demanding 3D applications, both in terms of high frame rates and high-fidelity graphics.

Anyware supports the full RGB color space which is particularly important for design visualization, where subtle differences in shade and color within rendered scenes can not only help enhance realism, but reveal potential errors in the design.

The beauty of Anyware is that it can adapt to the network, so users can get a fluid experience in their 3D application's viewport,

even when bandwidth is constrained.

To maintain high interactivity, PCoIP automatically adjusts compression to match the network conditions. This temporarily sacrifices image quality but, as soon as the 3D model stops moving, PCoIP's build-to-lossless (BTL) color accurate encoding will render the 3D model in full detail, with super sharp 'pixel accurate' geometry, text, and rendered materials.

Of course, home internet connections can be extremely variable, so Anyware also has another trick up its sleeve — the ability to dynamically switch between CPU and GPU encoding.

CPU encoding in Anyware uses highly efficient AVX2 processing and boasts enhanced color accuracy. As a result, a bump in bandwidth may be needed to achieve lossless display reproduction. In contrast, GPU encoding leverages hardware video encoder features such as motion compensation to

optimize network bandwidth.

With 'Auto-Offload' HP Anyware can automatically switch between CPU and GPU encoding, as and when a workload dictates — or to free the resources of the workstation for CPU-intensive tasks such as offline rendering or point cloud processing.

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Tuned for professional USB devices

In addition to the traditional mouse and keyboard, many architects and engineers rely on specialist USB input devices. This includes the 3Dconnexion SpaceMouse and Wacom tablets and pen displays.

With traditional stand-alone workstations these USB devices plug straight in and require custom drivers to give them their full functionality. The SpaceMouse

allows architects to precisely manipulate 3D models by pushing, pulling, twisting or tilting the controller cap for intuitive pan, zoom and rotation. Wacom tablets and displays feature pressure sensitive pens to simulate concept sketching on paper or to give precise control when touching up rendered images in Photoshop with a variety of brushes.

The challenge for all virtual workstations, especially over longer distances, is how to ensure these devices feel fully responsive.

HP Anyware features special optimizations to help ensure users of Wacom or 3Dconnexion devices are able to work effectively in remote workstation environments.



IMAGE COURTESY OF 3DCONNECTION